Cuckoo Hashing

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Algorithmic Desing
2022-2023

Introduction

Dictionary

Key		*Value*
x	$\longrightarrow$	α
y	$\longrightarrow$	β
w	$\longrightarrow$	θ

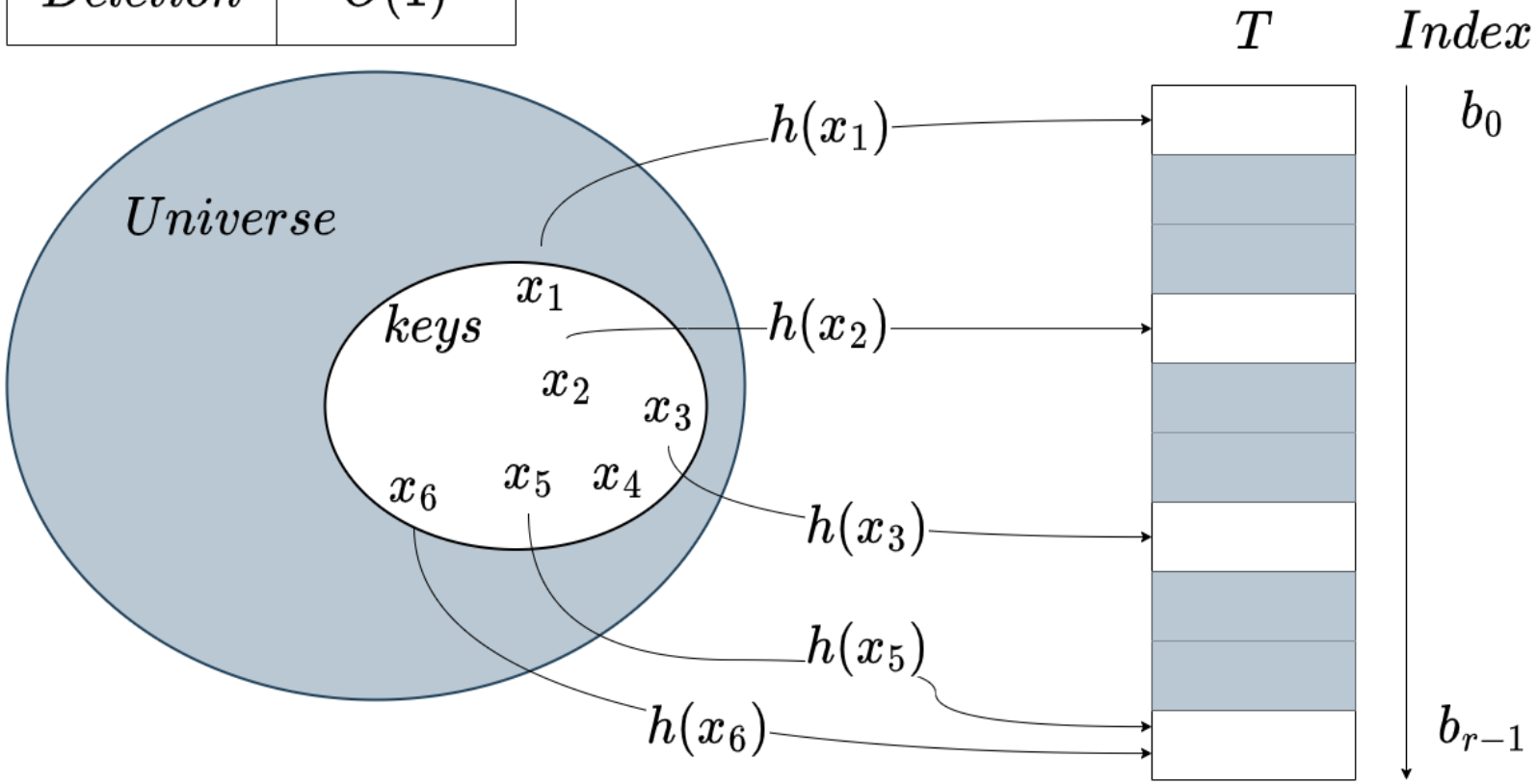
$D[key] \sim Search$

$D[key] = value \sim Insert$

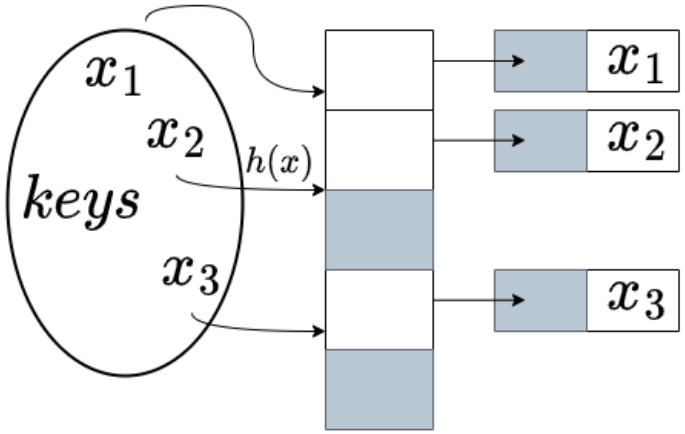
$delD[key] \sim Delete$

Lookup	$O(1)$
Insertion	$O(1)$
Deletion	$O(1)$

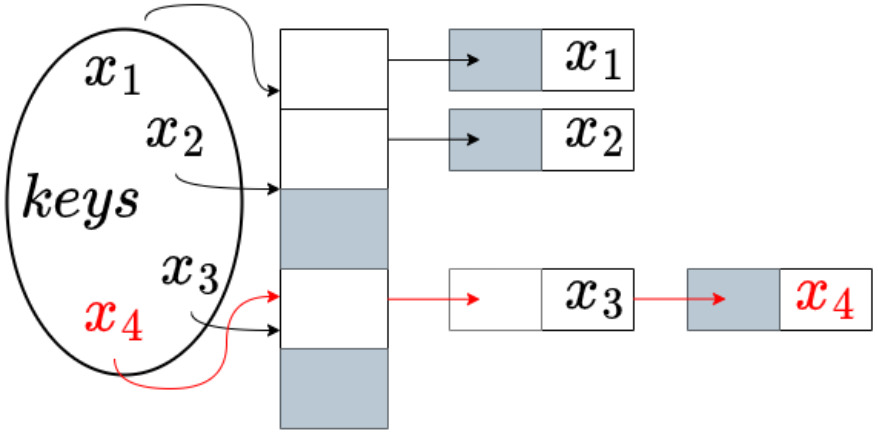
HashTable



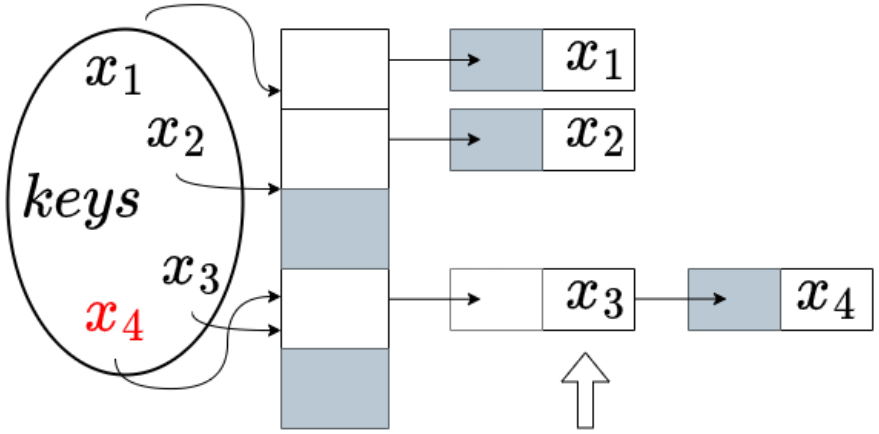
ChainedHashing



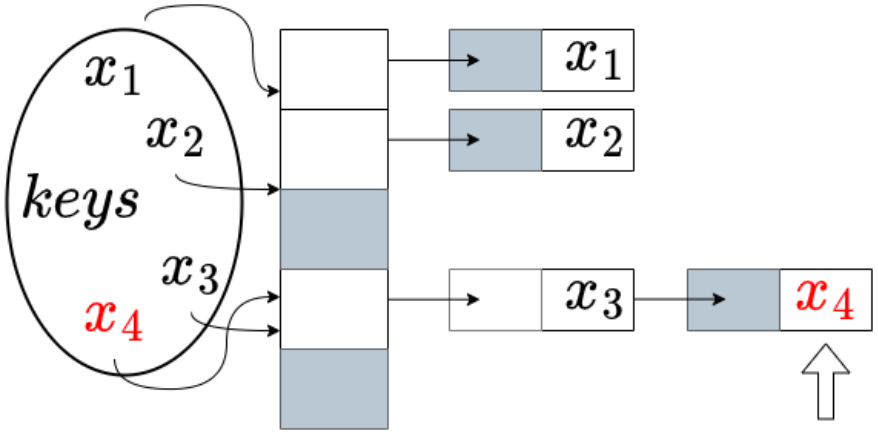
InsertionO(1)



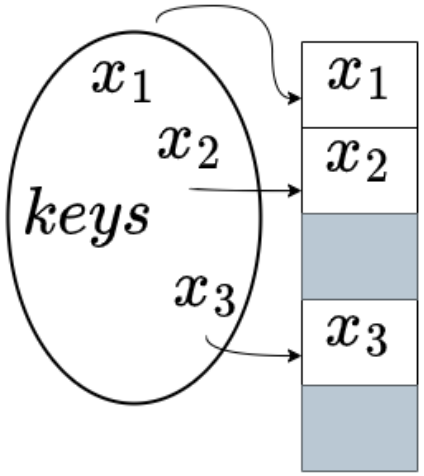
Lookup/DeletionO(n)



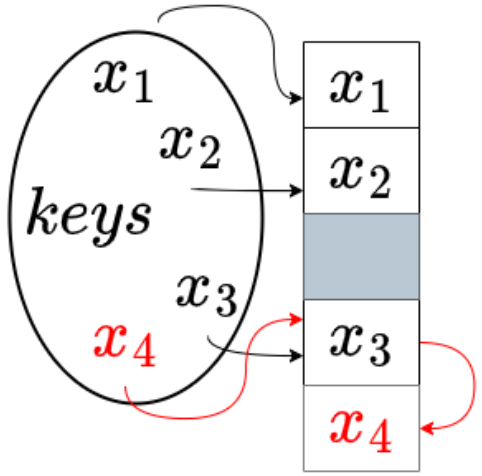
Lookup/DeletionO(n)



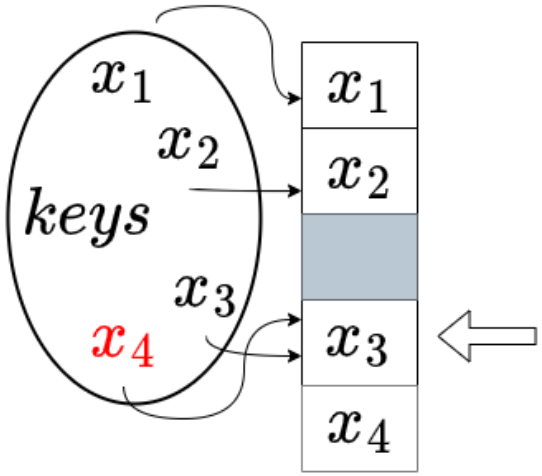
LinearProbing



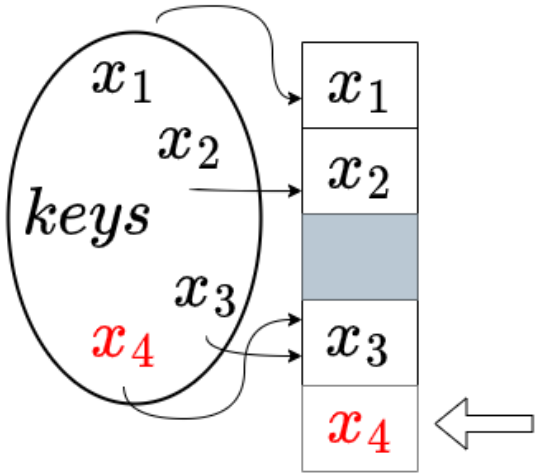
InsertionO(n)



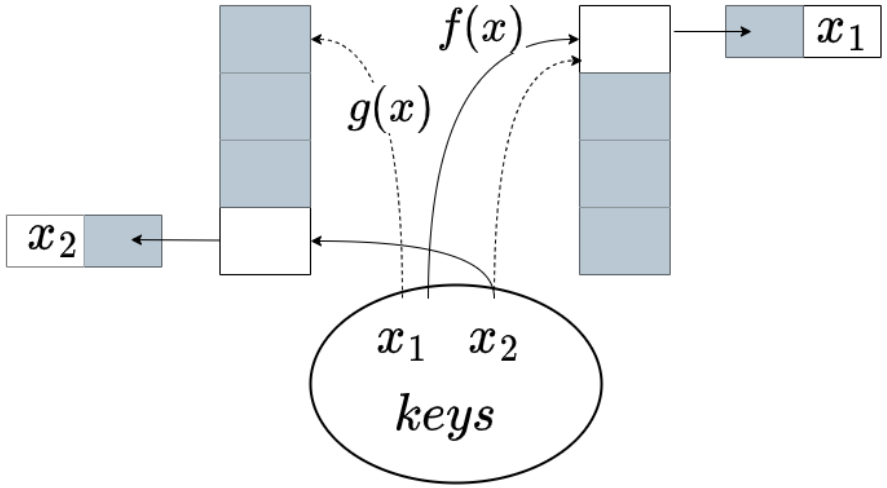
Lookup/DeletionO(n)



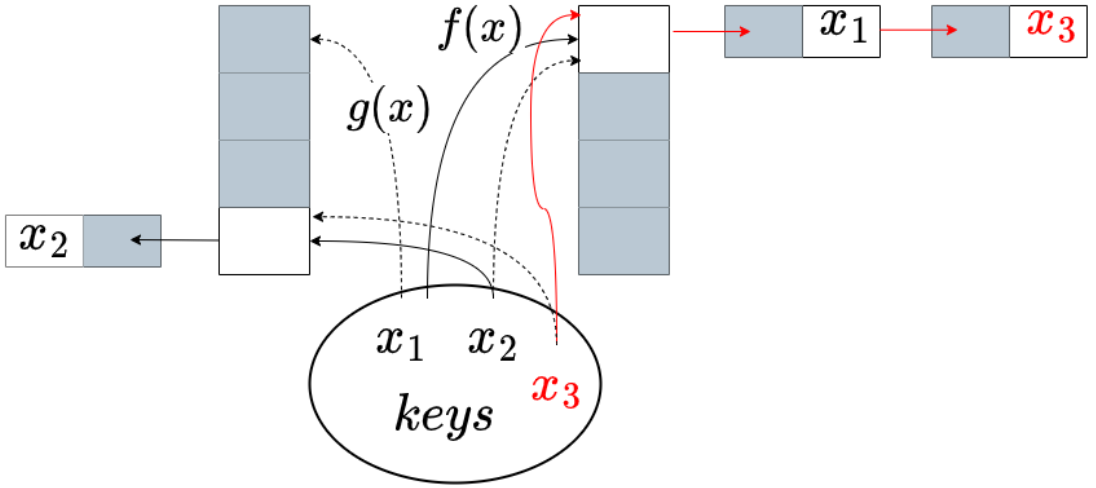
Lookup/DeletionO(n)



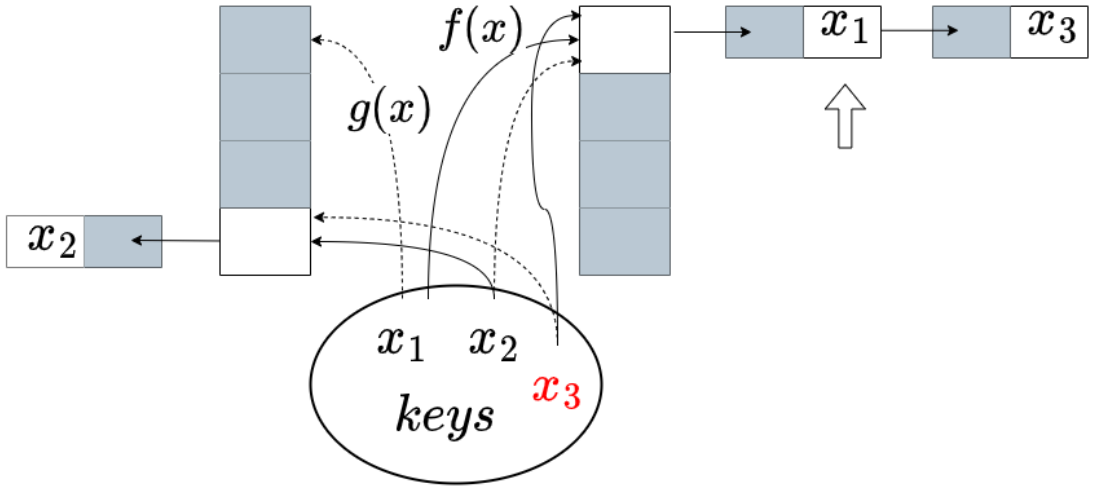
$Two-wayChaining$



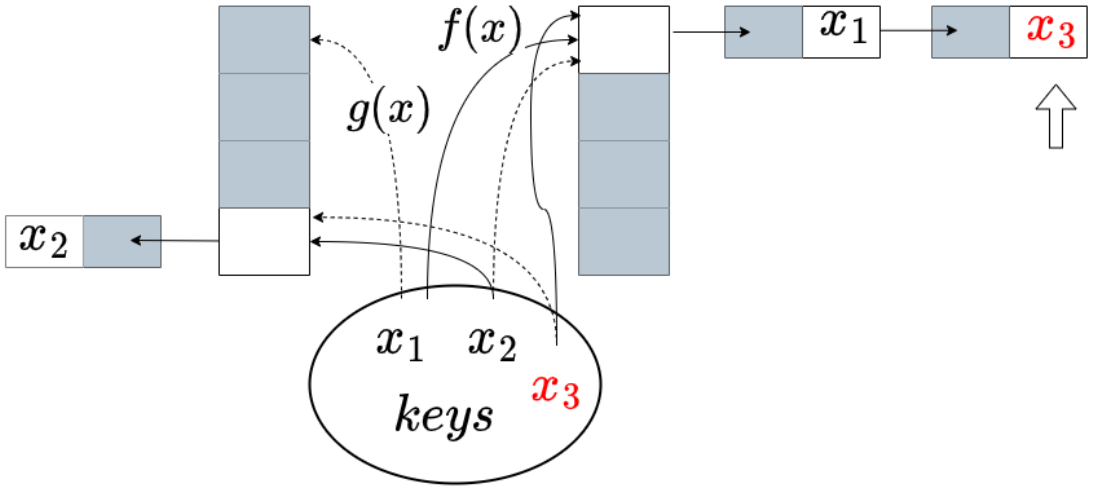
$InsertionO(1)$

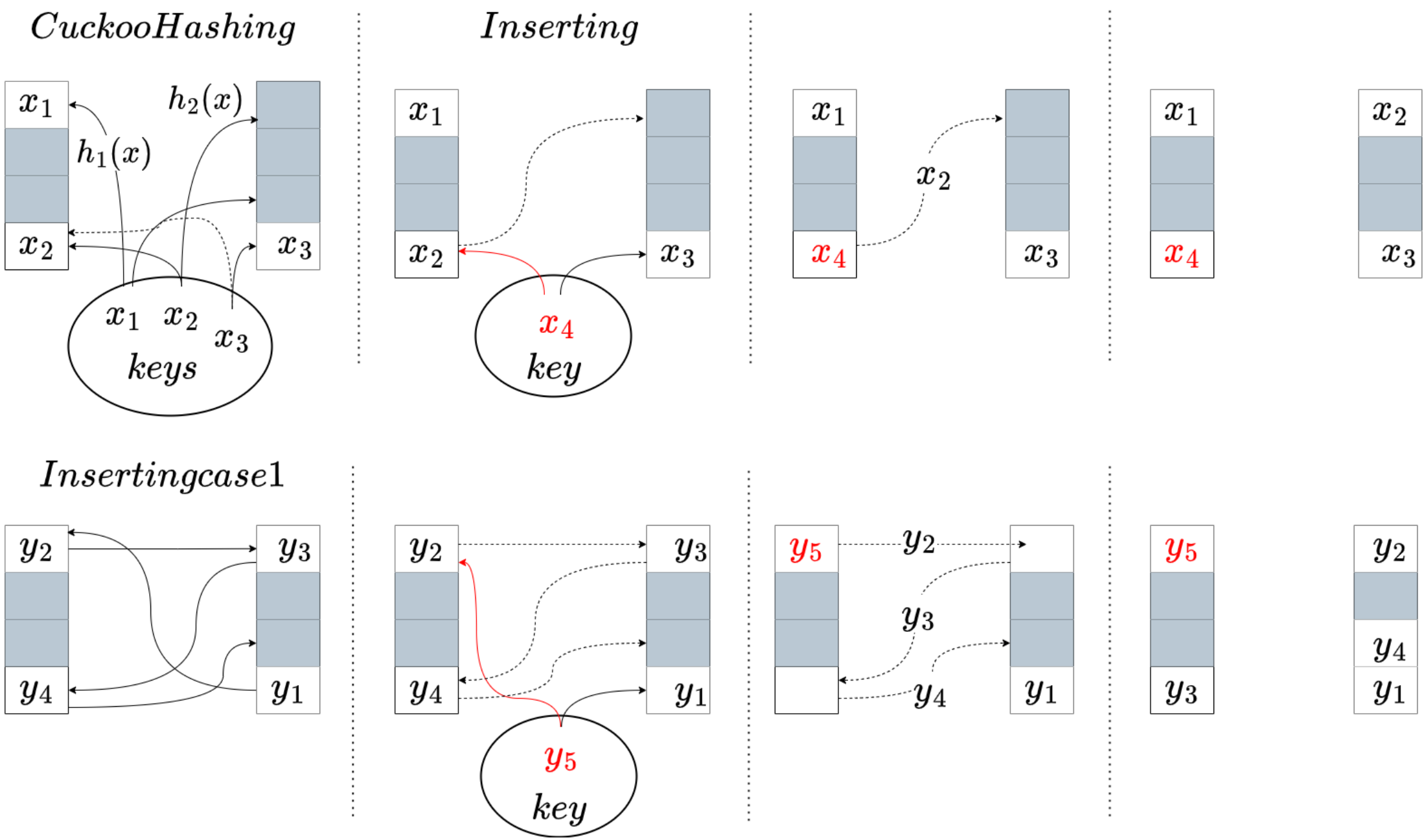


$Lookup/DeletionO(n)$

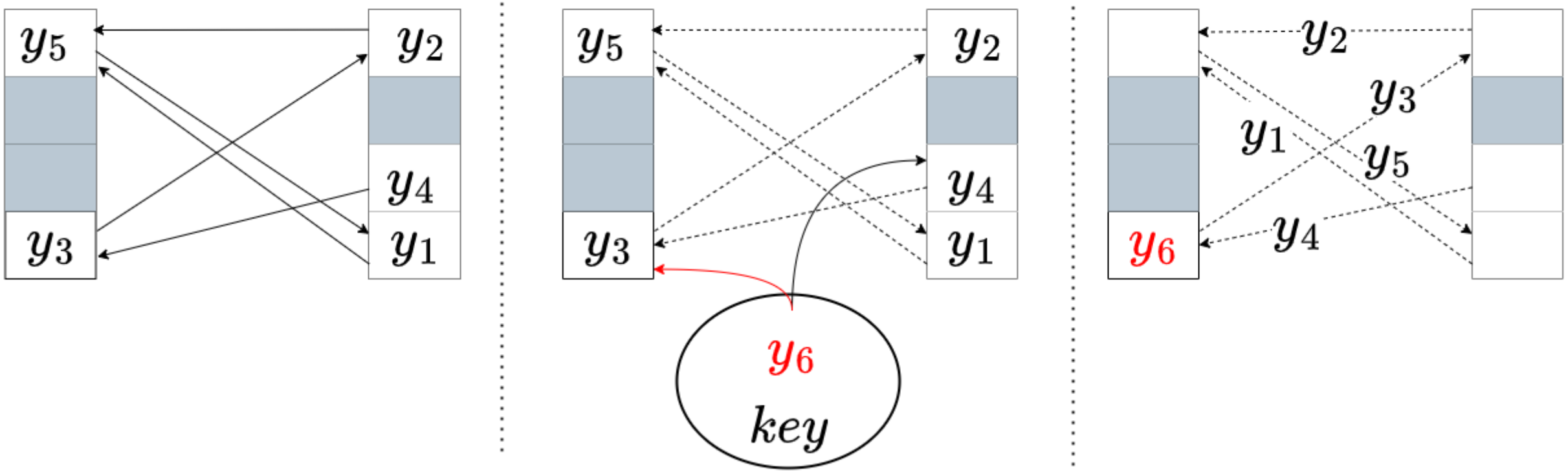


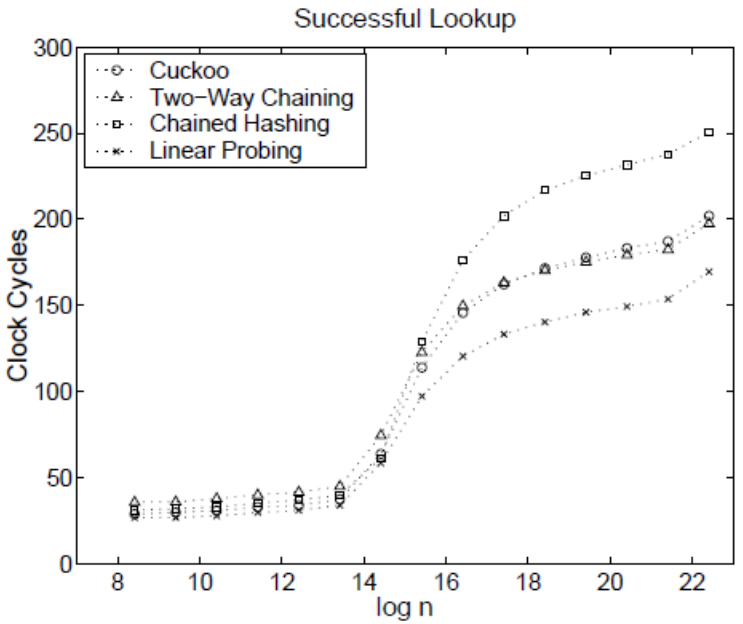
$Lookup/DeletionO(n)$

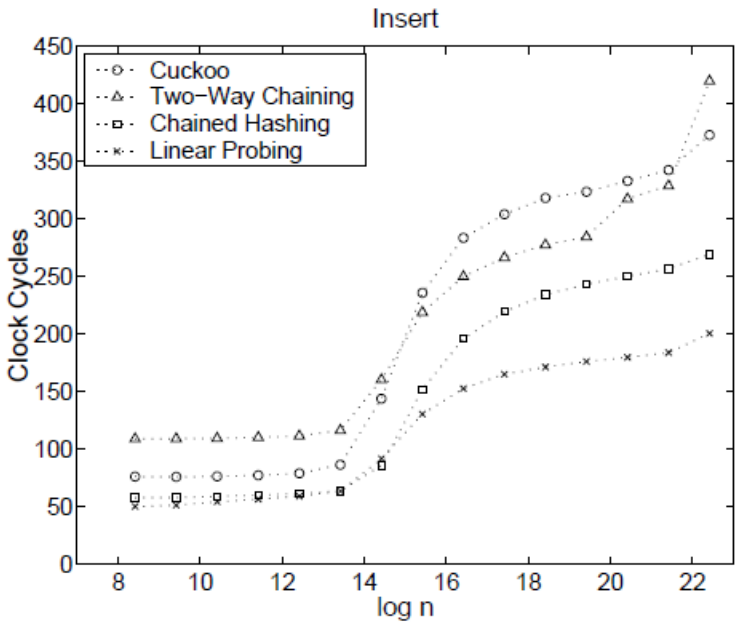



CuckooHashing
x_1
$h_2(x)$
$h_1(x)$
x_2
x_3
x_1 x_2 x_3
keys
Inserting
x_1
x_2
x_3
x_4
key
x_1
x_2
x_4
x_3
x_1
x_4
x_2
x_3
Insertingcase1
y_2
y_3
y_4
y_1
y_2
y_3
y_4
y_1
y_5
key
y_5
y_2
y_3
y_4
y_1
y_5
y_3
y_2
y_4
y_1

Insertingcase2




Successful Lookup
Cuckoo
Two−Way Chaining
Chained Hashing
Linear Probing
Clock Cycles
log n
0
50
100
150
200
250
300
8
10
12
14
16
18
20
22


Insert
Cuckoo
Two−Way Chaining
Chained Hashing
Linear Probing
Clock Cycles
log n
0
50
100
150
200
250
300
350
400
450
8
10
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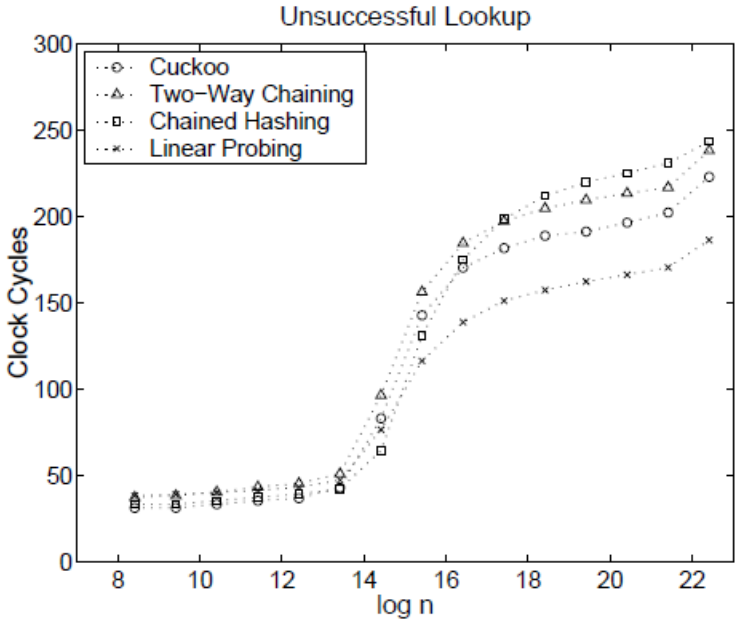
14
16
18
20
22


Unsuccessful Lookup
Cuckoo
Two−Way Chaining
Chained Hashing
Linear Probing
Clock Cycles
log n
0
50
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250
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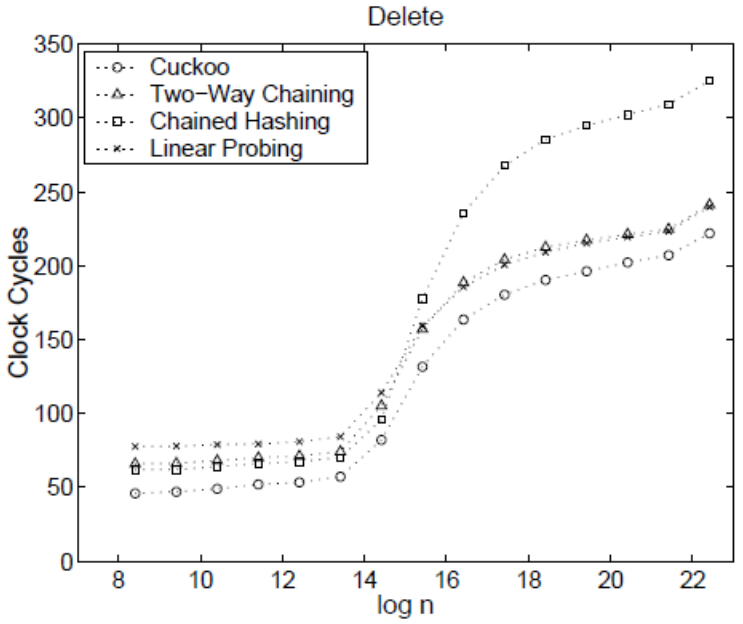
22


Delete
Cuckoo
Two−Way Chaining
Chained Hashing
Linear Probing
Clock Cycles
log n
0
50
100
150
200
250
300
350
8
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12
14
16
18
20
22